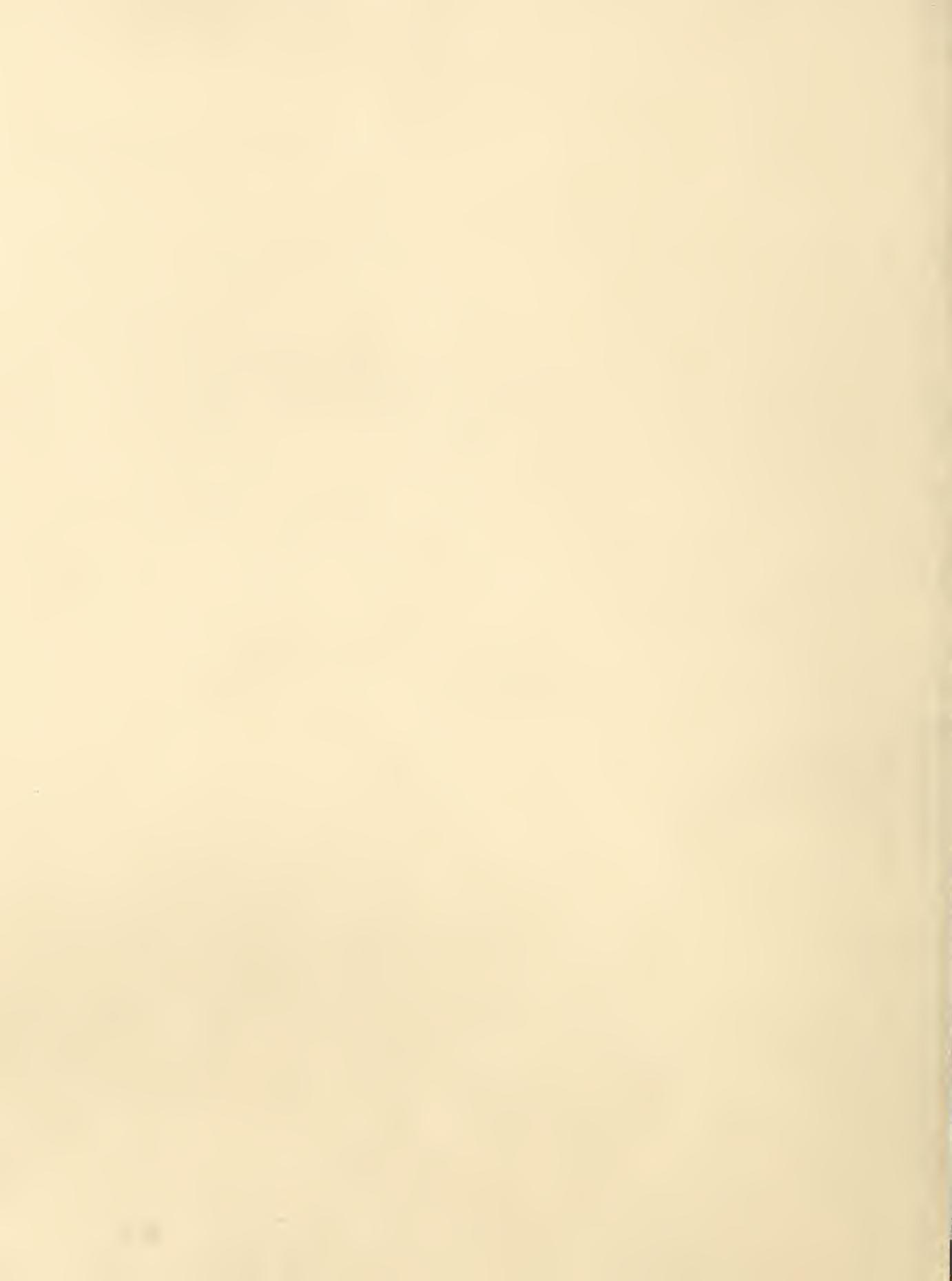


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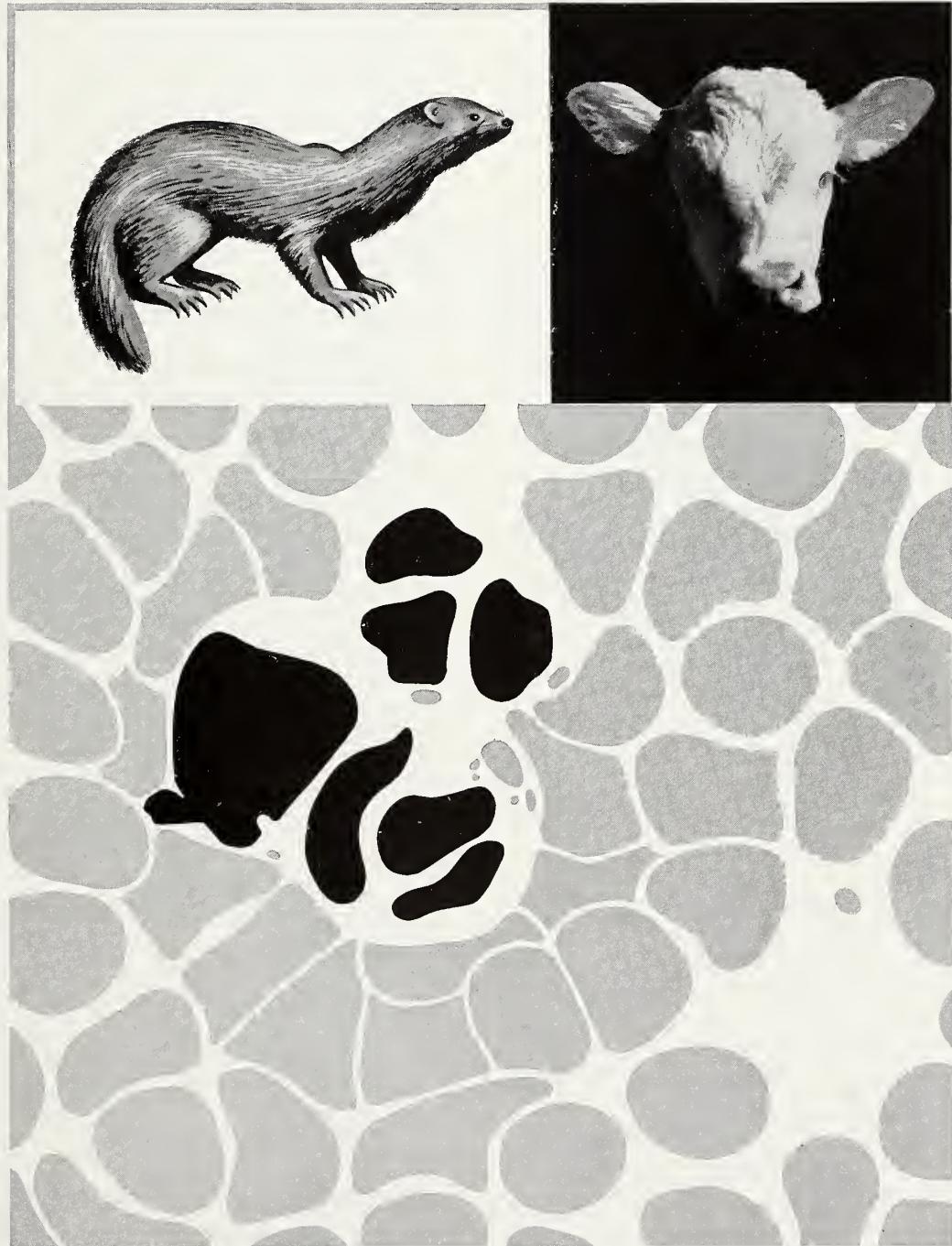
Research

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AGRICULTURAL Research

February 1965/Vol. 13, No. 8

That Critical Final Round

He was tough and wiry . . . and winning all the way . . . until the final round, that is. It was then that he dropped his guard—and was floored for the count.

What has this to do with agriculture and the control of diseases and pests? When eradication is our goal, we can't afford to drop our guards until the final pest or disease is down for the count.

Our magazine reports on page 9 that we have reduced the incidence of bovine tuberculosis to less than 0.5 percent among all cattle in 2,725 of the Nation's 3,102 counties. Such remarkable progress *can* lead to complacency. We might even say . . . "The battle is won." BUT IS IT?

The second we *think* we've won the bout is that critical moment when agriculture could receive a costly blow. It takes just one fertilized khapra beetle, for example, to start an infestation in a grain elevator. And this beetle is the world's worst destroyer of stored grain.

The screwworm fly has been eradicated from the southeastern United States—and is 99 percent eliminated from the Southwest. This costly livestock pest would be back—eventually in as large numbers as before—if we let up in our eradication efforts and dropped our guard that prevents the fly's re-entry from infested areas of Mexico.

Once an opponent has been eliminated, it is human nature to forget him and concentrate on new challengers. It is good policy, however, to remember past encounters—so as not to become complacent in the future.

Abiding by this philosophy, one Southeastern State put out a press release earlier this year which reminded livestock producers of the successful Federal-State eradication campaign against the screwworm fly. The press release read something like this:

"At this time of the year in the 1950's, we reminded livestock producers of steps they should take in supporting the campaign against the costly screwworm fly. Since this pest apparently has been eliminated from our area, the reminder need only be one of awareness—to be alert to any possible reinfestation."

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**Orville L. Freeman, Secretary,
U.S. Department of Agriculture**

**B. T. Shaw, Administrator,
Agricultural Research Service**

Identified:

TWO Corn Stunting Diseases

Scientists find mode of transmission, continue intensive search for remedies

■ When a plant-stunting disease appeared in Ohio and Mississippi corn fields in 1962, ARS and agricultural experiment station scientists began high-priority research in several States to determine what causes the disease, how it is transmitted, and how it can be controlled.

The scientists have now conducted field studies through two growing seasons and, in addition, have conducted extensive laboratory and greenhouse research. Although they have not yet found a final solution, they have developed much basic information.

One of the most important findings is that there are actually two virus diseases. Until 1964, scientists thought they were contending with a single disease, which they called corn stunt disease. The newly identified corn virus is called maize dwarf mosaic, and the original is still called corn stunt disease.

Damage caused by the two diseases has ranged from minor losses in some fields to total loss in others.

Scientists recovered the corn stunt virus from diseased plants collected in Mississippi in 1963. Although the symptoms of the disease found in Ohio were similar to corn stunt, the variance in disease transmission led scientists to believe that a different virus might be involved.

Corn stunt disease, which first appeared in Mexico in the 40's, is known to be transmitted from diseased to healthy plants only through the feeding activities of two kinds of leafhop-



Corn stunt disease shortens uppermost internodes, causing corn plant to appear bunched at top. Height is about a third of normal.

pers—*Dalbulus maidis* and *Dalbulus climatus*. These leafhoppers have not been found in the Midwestern States where maize dwarf mosaic occurs.

Scientists also point out that corn stunt virus cannot be spread from infected to healthy plants by contact or rubbing. The virus causing maize dwarf mosaic can, in contrast, be easily transmitted mechanically by rubbing juice from infected plants into healthy plants.

In 1964, scientists found that corn leaf aphids can transmit maize dwarf

mosaic. They also believe that the disease may be spread by other insects—and possibly by farm machinery.

Both diseases have spread and become more severe since they were first observed. In 1964, corn stunt was reported in every county in Mississippi and in scattered areas throughout the other Southern States.

Maize dwarf mosaic has been reported in Ohio, Kentucky, Indiana, Illinois, Arkansas, Missouri, Iowa, Virginia, and Tennessee. Scientists



Plants infected with corn stunt disease early in development produce ears that are more severely affected (left) than do plants infected later in growth stage (center). Ear at right is from a healthy corn plant.

believe that the disease may also be present in other Southern States and California. Ohio has been hit the hardest; the disease has been reported in all but 6 or 7 counties in the western part of the State, where loss in yield was estimated at 5 million bushels in 1964.

Development of resistant corn lines seems to offer the best means of controlling these diseases. Extensive screening studies of hundreds of corn lines were carried out in 1964 in locations in Mississippi and Ohio where the diseases have been particularly severe. A few lines that appear resistant have been found, but scientists emphasize that definite conclusions cannot be based on a single year's results.

Some of the most promising resistant lines are from Mexico, and developing commercially adaptable corn from these lines will take a considerable research effort. Plant breeders are also investigating the possibility that some lines may be resistant to feeding by the insect vectors.

How the viruses overwinter is being closely studied. The prime suspect appears to be Johnsongrass,

because it is a perennial, and because it grows in most of the areas where the diseases have occurred. Other possible overwintering hosts are also being investigated.

Entomologists are examining the possibility that other insect vectors may be involved. For example, they are interested in the fact that even though symptoms of corn stunt showed up early in the growing season in 1964, none of the known leafhopper transmitters could be found during this period.

Symptoms of corn stunt and maize dwarf mosaic appear first as faint yellowish stripes in the younger leaves, together with shortening of the uppermost internodes. The shortened internodes cause the plant to appear bunched at the top. The height of the plant is only one-third to one-half that of healthy plants.

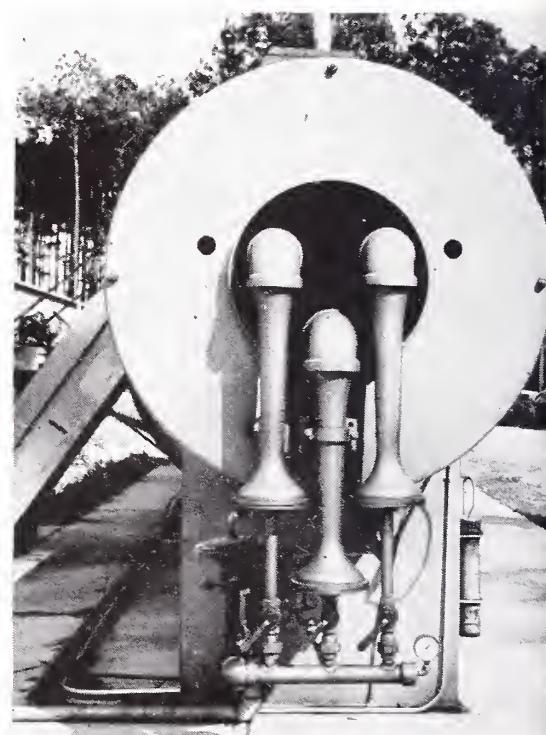
As the disease progresses, irregular areas of reddish purple usually develop in the leaves. Diseased plants frequently produce an increased number of ears that are smaller than normal and they often bear little or no seed.☆

Coastal

Scientists develop agronomic techniques that insure uniform crop for processors

■ Processing of Coastal bermudagrass into meals and pellets, a relatively new but growing industry in the Southeast, should benefit from information developed in recent ARS-Georgia fertilization studies.

Scientists found that proper timing of four applications of nitrogen fertilizer during the growing season overcomes one of the main obstacles to expanded bermudagrass processing. This obstacle is the variability in quality and chemical composition



Bermudagrass . . .

in meals and

pellets

from cutting to cutting.

Commercial processors need Coastal bermudagrass containing 14 to 16 percent crude protein and no more than 30 percent crude fiber. The bermudagrass should also have at least 100,000 International Units of Vitamin A equivalent per pound.

Fluctuation in forage quality at various times in the growing season can be overcome by applying 600 pounds of nitrogen per acre in four applications of 150 pounds each. The

first application, in March, should be followed by treatments after each of the first three cuttings. Cuttings should be made every 4 weeks.

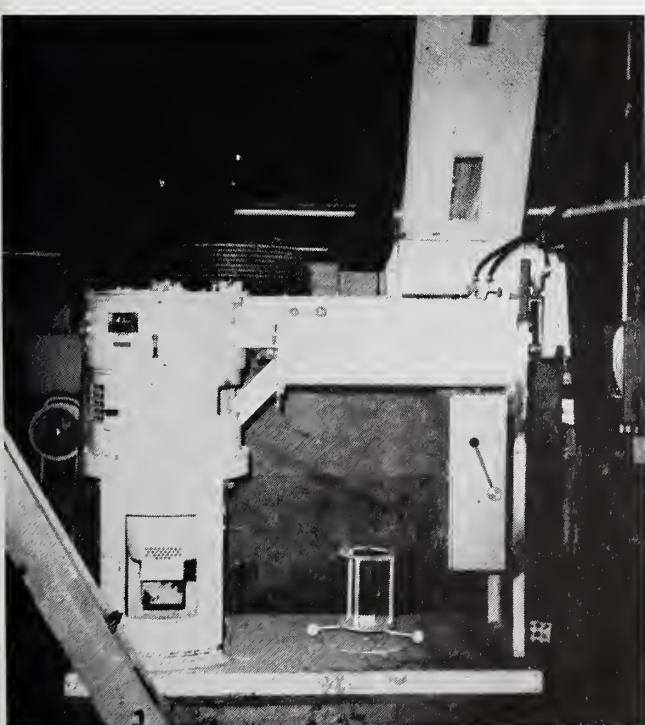
This fertilization program for bermudagrass was developed by ARS scientists working in cooperation with the University of Georgia's Coastal Plain Experiment Station at Tifton.

In all their tests, agronomists R. H. Hart and J. E. Jackson and geneticist G. W. Burton applied a total of 600 pounds of nitrogen in the form of am-

monium nitrate to all test areas and cut the bermudagrass every 4 weeks. The number and the timing of the applications were varied, however.

Although scientists have known for some time that grass fertilized annually with 600 pounds of nitrogen per acre, and cut every 4 weeks, has an *average* composition within the required range. Only in the current tests have they devised a program for producing high quality and standard composition at every cutting.☆

Dehydration and processing of Coastal bermudagrass into meals and pellets can make high quality roughage available in forage-short areas of the South. The high-yielding crop (right) is cut every 4 weeks, put through a dehydrator (left), and then processed into a meal or put through a pellet mill (center).



A GENETIC MARKER

of disease susceptibility?

Studies uncover a common denominator among albino-like mink, cattle, children

■ Mink, particularly Aleutian or "Blue" mink, may be the key to some very important medical research on the interaction of genetics with susceptibility or resistance to disease.

Studies of the blood of this fur-bearing animal have uncovered what could be a convenient genetic marker of disease susceptibility.

In 1941 a mutation occurred in a single mink on a western Oregon

ranch, resulting in an animal with a beautiful gun-metal gray pelt. Within a few years breeding stock of Aleutian mink brought thousands of dollars for a single animal.

Although the light pelt color is in great demand, mink ranchers have a difficult time raising Aleutian mink, which are often called "one-year mink."

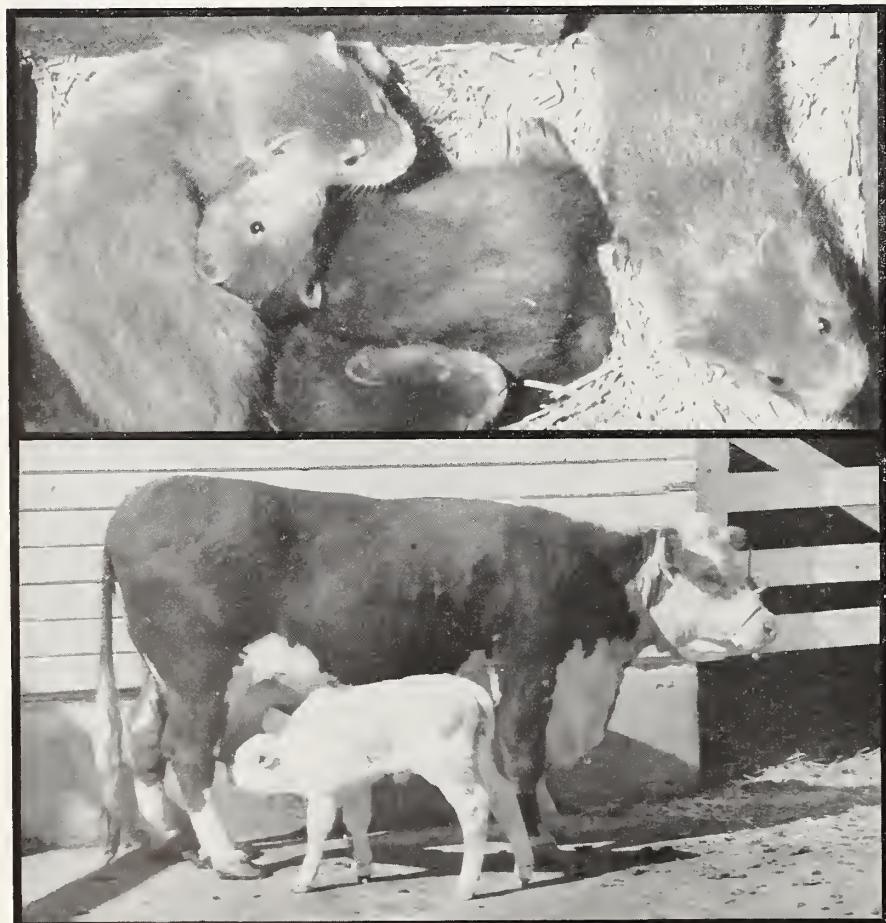
Aleutian mink are highly suscep-

tible to a wide variety of bacterial infections and to a particular virus which causes Aleutian disease. The reason for this remarkable susceptibility to disease agents was studied by scientists at the ARS Fur Animal Disease Research Laboratory and the Department of Veterinary Pathology at Washington State University, both at Pullman.

They found that the white blood cells of Aleutian mink resembled those found in a little-known, invariably fatal condition of man known as the Chediak-Higashi syndrome. Children with this syndrome—like the Aleutian mink—have light hair, pink eyes, and abnormal sensitivity to bright light, all evidence of partial albinism. These children are highly susceptible to bacterial infections, and most die before reaching their seventh birthday.

By a remarkable coincidence, the Washington State University campus houses the world's only herd of partial albino Hereford cattle. Besides having the white-blood-cell abnormality, these cattle have grey eyes and avoid bright sunlight. They are white to buff colored, but their markings usually show up as a fawn "ghost" pattern.

In all three species—man, mink, and cattle—the abnormal pigmentation and white blood cells are inher-



Abnormal granules were found in the white blood cells of the Aleutian mink (top left), as well as in the white blood cells of the partial albino Hereford calf (bottom left).

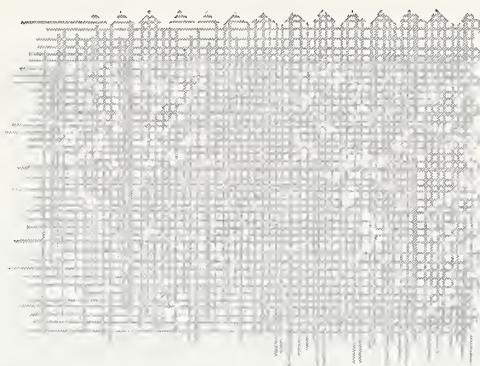


White blood cells of mink show the abnormal granules (arrow) that are found in animals with Chediak-Higashi syndrome, a condition causing albino-like characteristics.

ited as a non-sex-linked simple Mendelian recessive trait. From studies of affected animals, it is apparent that the abnormal granules in the white blood cells are a convenient genetic marker of disease susceptibility.

These granules do not function normally in the process of bacterial destruction in the white cells, apparently failing to release their enzymes which kill the bacteria. This lack of function explains the susceptibility to bacterial infections commonly observed in the three species.

In addition to disease susceptibility, many members of the three species with this condition are "bleeders" and after injury have prolonged periods of bleeding. While the exact cause of the prolonged bleeding is as yet unknown, the scientists feel it is probably related to a deficiency of one or more of the normal clotting factors in blood.☆



Foiling the Fungus . . .

British scientists protect cotton fabrics by altering cellulose molecules—making them unattractive to fungus enzymes

■ Scientists at Manchester, England, have found a way of rot-proofing cotton fabrics by preventing fungi-produced enzymes from attacking the cotton fiber. The research, conducted by the Cotton, Silk, and Man-Made Fibers Research Association, may lead to a cheaper and better way of rot-proofing cotton for awnings, tents, and other outdoor uses.

Using the fungus *Myrothecium verrucaria* as a tool in basic research, these scientists found that two enzymes produced by the fungus are responsible for the loss in strength of the cotton fiber. One of the enzymes breaks the cellulose molecule into large fragments, and the other attacks the fragments and converts them to simple sugar molecules.

The enzyme attacks the fiber by attaching itself to the cellulose molecules. The scientists reasoned that if this attachment could be interfered with, the cellulose molecules would resist rotting. They combined bulky chemical molecules (carbanilate groups) with cotton cellulose molecules—on the theory that the bulky molecules would prevent the enzyme

from attaching itself closely to the cellulose molecules.

The results were good. Only a small proportion of the chemical molecules are needed to rotproof the cotton—a ratio of 1 to 5. This small proportion is important, because the cost of rotproofing increases with the amount of the chemical used.

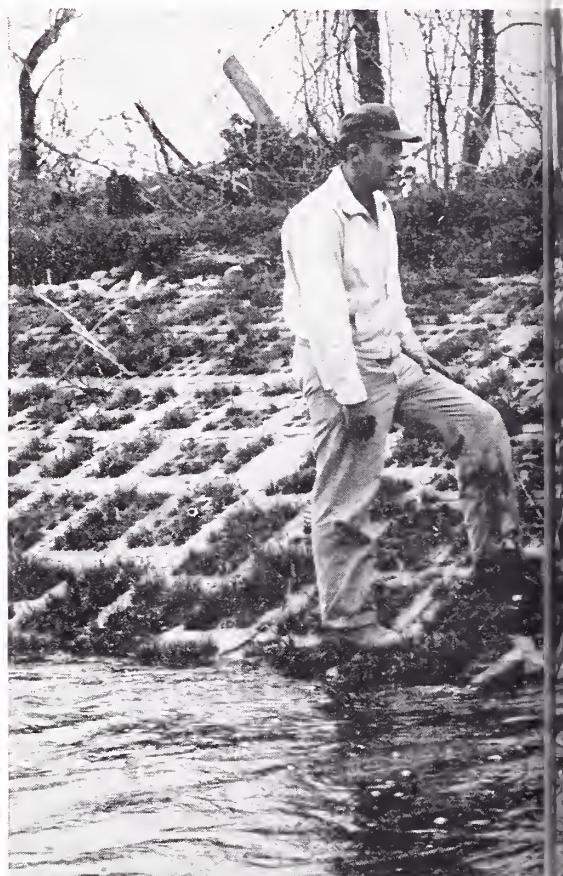
To perform this basic research, the scientists produced a cell-free culture filtrate that simulates the enzymes produced by fungi when the fungi attack cotton material. This is the first time the enzymes have been simulated.

The scientists also developed a special respirometer so they could follow, by microscopic observation, the process of digestion of cotton fibers by the enzyme.

The research was financed by a grant from ARS, with foreign currencies received by the United States from the sale of surplus agricultural products under Public Law 480. These currencies cannot be converted into dollars for use in the U.S., but part of them can be used as grants to foreign scientific institutions for research benefiting U.S. agriculture.☆

"WAFFLING" STREAMBANKS

Engineering



■ Specially designed concrete blocks—looking remarkably like waffles—may replace stone riprap for erosion control along some streambanks.

ARS hydraulic engineers D. A. Parsons and R. P. Apmann found that the cellular blocks were superior to quarried stone in 8-year studies along a section of New York streambank.

These researchers, working in cooperation with the Soil Conservation Service and the Agricultural Experiment Station of Cornell University, Ithaca, N.Y., tested an experimental revetment of 630 blocks laid along Buffalo Creek in 1956 and 1957.

The experimental revetment runs about 120 feet along the creek and 14 feet up the bank. Upstream and downstream from the revetment, the

engineers installed riprap revetments with stones that averaged 17 inches in diameter.

The blocks, which are 4 inches thick, 16 inches wide, and 24 inches long, have several advantages over riprap. They are lightweight and convenient to handle. They key together and form a mat that is flexible enough to conform to subgrade changes. And each block has 2 dozen 2- by 2-inch holes, which hold gravel or crushed rock against the bank. Grass or shrubs can be planted in the holes to stabilize the bank.

Five floods during 8-year test

Floods—accompanied by ice floes—occurred on Buffalo Creek five times during the 8 years of tests. The concrete-block revetment was in

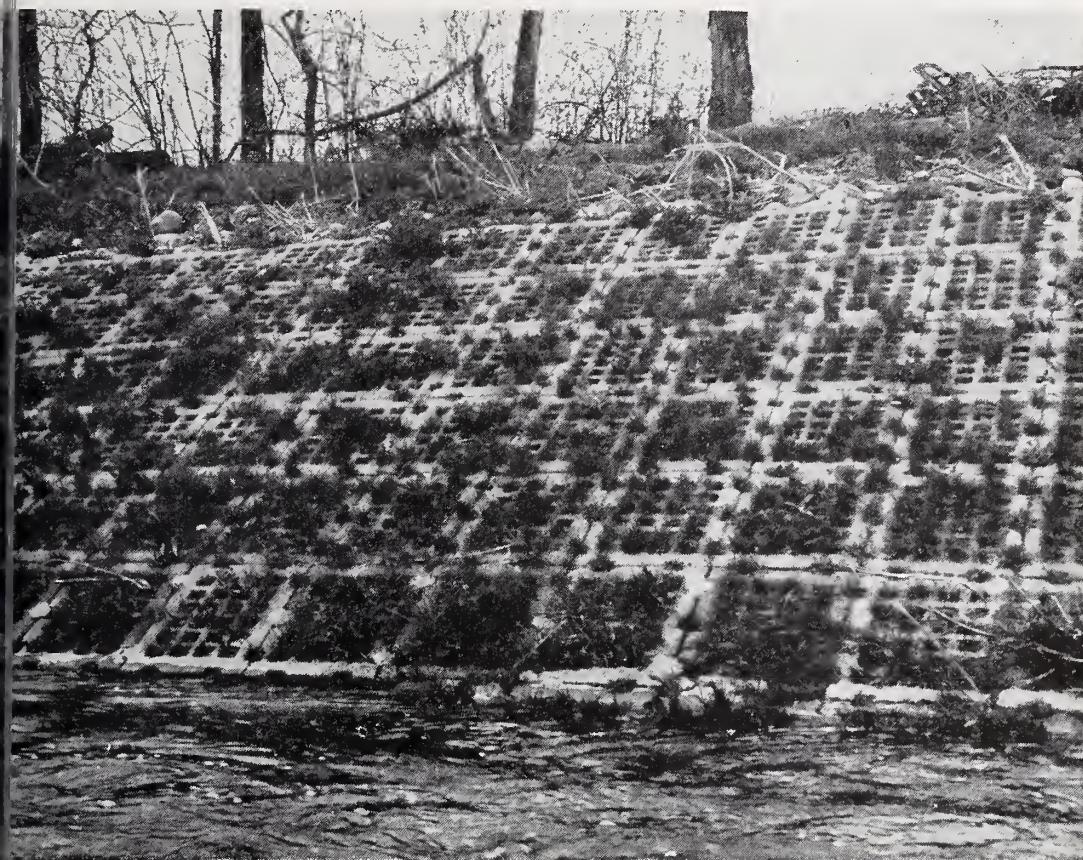
better condition after every flood than the riprap revetments. In 1957, for example, only one concrete block was lost in contrast with a large amount of riprap that was carried away. Flood water shifted some of the stones at the bottom of the riprap revetment, and flood-borne debris completely bent over the 1-inch diameter steel pins that held the stones in place.

Of the 630 blocks laid, only 3 have been lost because of flood water during the 8-year test period. A few blocks crumbled under the impact of several years' ice floes, however, because the concrete that had been used for casting the blocks was mixed too dry.

The engineers estimate that the two types of revetment should cost about the same if the concrete blocks are

AGAINST EROSION

compare specially designed concrete blocks with stone riprap



The 16- by 14-inch blocks key together (far left), forming a waffle-like appearance along the streambank. Two years after installation (left), the bank is well protected by the blocks—interlocked by grass growing from the cellular structure.

mass produced and if the quarried stone is available locally. On a mass-production basis, the block revetment would have cost about \$10 per square

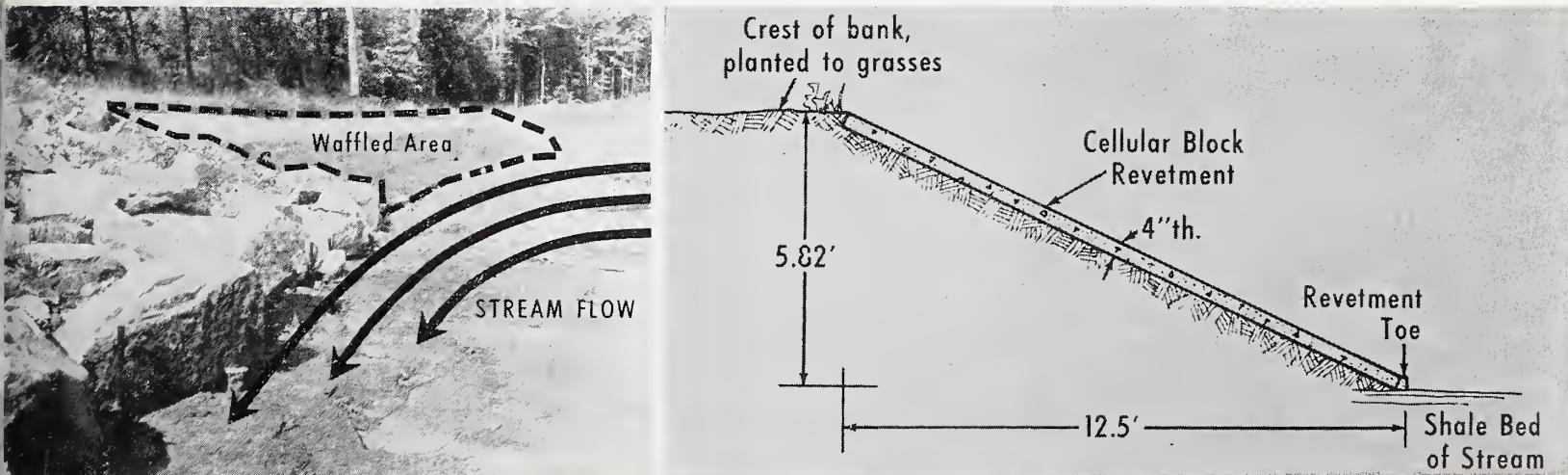
yard, while high-quality 17-inch riprap in the Buffalo Creek area averages \$9 per square yard.

A 24-inch stone would be needed to

provide protection equal to the concrete blocks. The cost of concrete blocks would be competitive with locally available 24-inch stone.☆

LEFT—The researchers compared stone riprap (foreground) with the specially designed concrete blocks—for protection against the erosive force of streamflow.

RIGHT—Cross-sectional drawing shows the construction features, including the slope of the streambank.



IT'S IN THE BAG



Screening for Two Diseases - with One Backtag

The outlook for eradication of two major cattle diseases—brucellosis and tuberculosis—has improved through a development initiated a year ago in Minnesota market cattle testing.

The development, an extension of backtagging, permits one livestock identification method to screen cattle for the presence of both diseases—without slowing down the slaughtering process. It also provides the basis for establishing and maintaining Accredited TB-Free and Certified Brucellosis-Free areas.

Although backtagging alone has been satisfactory for brucellosis testing, the procedure could not be used for identifying cattle with tuberculosis. The animal's identity was lost before meat inspectors had an opportunity to observe the carcass for the presence of TB lesions.

The key to solving the problem is a small plastic bag which encases the backtag (and a blood sample) and makes it possible to maintain identity of the cow's head, viscera, and carcass with the herd of origin—throughout the entire meat inspection post mortem. The procedure, perfected in a major St. Paul packing plant, was developed by State regulatory veterinarians and ARS meat inspectors and animal disease eradication personnel.

About 2 million cattle and calves are received annually at the St. Paul market, and nearly all of the eligible cattle are backtagged. Most of the backtagging is done by commission companies under contract with ARS.

As these tagged cattle move into slaughter, a lay meat inspector removes the backtag and places it in

a plastic bag. This is done just before the hide is removed.

The inspector then attaches the plastic bag to the carcass with a deadlock clamp. Once the skinning is completed, the viscera is removed and placed on a belt that is continuous and coordinated with the movement of the carcass on the rail.

After examining the viscera, the inspector opens the heart, collects a blood sample in a vial, and places the corked vial in the plastic bag on the carcass. The carcass continues along the rail for inspection.

If no tuberculosis lesions are found, the meat inspector removes the plastic bag, and the carcass continues along the rail. If lesions are found, the bag is left on the carcass, which is

diverted for thorough examination by a veterinarian. Should tuberculosis be confirmed, positive identification of herd of origin is easily established.

The plastic bags containing backtags and blood samples from all the cattle are forwarded to the State-Federal serology laboratory, where the blood test for brucellosis is conducted.

Each time a livestock producer markets identified cattle that are free of brucellosis or tuberculosis, he has further assurance that infection has not entered his herd. This information is the basis for establishing and maintaining Accredited TB-Free and Certified Brucellosis-Free areas.

Positive identification of a cow showing TB lesions during regular



kill is accomplished with a minimum of record keeping. The backtag information is recorded on a post-mortem or ADE 6-35 report. The name and address of the cow's owner are easily obtained from the records made when the tags were applied.

Five regional laboratories in Minnesota forward brucellosis test results to the State Veterinarian's office, where herd history cards are maintained. These market testing results may be used to recertify a county as a certified brucellosis area for a 3-year period.

When the program was initiated in Minnesota in February 1964, about 2,500 cattle were backtagged that month. The number increased about 2,500 each month, so that in

June 1964 approximately 11,000 animals were backtagged, approaching 100 percent of the eligible animals entering the yards.

The plastic bag procedure has been adopted by all eight federally inspected slaughtering plants in Minnesota, plus one plant in North Dakota that has rail inspection. Five additional Minnesota slaughtering plants, using bed-type slaughtering practices, are following a modified procedure.

As of October 1964, Minnesota was applying backtags at the public stockyards only. The State plans, however, to institute backtagging procedures at the auction markets. This should provide for tagging of about 10 percent of the cows over 3 years of age in the State.

The Eradication Effort Keeps Pace with Goals

- The livestock industry has established goals for the eradication of brucellosis, which include reaching a nationwide Modified-Certified Brucellosis Area status by 1965. As of December 1964, more than 84 percent of the Nation's counties had met this goal (no more than 1 percent of the cattle and no more than 5 percent of the herds are infected).

- The industry's goal for a brucellosis-free Nation is 1975. New Hampshire, Maine, Rhode Island, Utah, and the Virgin Islands have already reached this status. On December 1, 1964,

2,670 counties had achieved modified-certified status. And of these, 326 counties located in 20 States, Puerto Rico, and the Virgin Islands had gone on to achieve a Brucellosis-Free status.

- Within the TB eradication effort, cattle in all counties in the United States have been tested for this disease since 1917. A total of 426 counties have been declared Accredited Tuberculosis-Free areas. In addition, 2,725 counties have reduced the incidence of TB to less than 0.5 percent and have qualified as Modified Accredited areas.☆

TOP LEFT—A lay meat inspector removes the identifying backtag from a beef animal before the hide is removed with pneumatic pullers. TOP RIGHT—The backtag is then placed in a plastic bag, and the bag is attached securely to the sternum of the carcass. BOTTOM LEFT—After examining the viscera, a meat inspector opens the heart and collects a blood sample for the brucellosis test.

BOTTOM RIGHT—The blood sample is placed in the bag with the backtag. At no time has the slaughtering procedure been delayed.

Insect-Resistant Cotton Strains?

■ Two characteristics of certain wild cottons can be bred into commercial cotton varieties to give them resistance to no less than five important insect pests, ARS researchers have discovered. No commercial varieties show any appreciable resistance to major insect pests.

The wild cotton plants are nectarless, having no nectar-producing glands except in the flower, and glabrous, having no epidermal hairs. Each characteristic provides resistance to insects in a different way.

The elimination of nectaries would cut off an important source of food for moths. Upland cotton, for example, has one to three nectaries on the lower side of each leaf, and on fruiting forms as well.

The glabrous trait offers insects a less desirable smooth surface on which to lay their eggs.

The most pronounced resistance apparently is to two of the most serious pests: the cotton bollworm and the tobacco budworm, which also attacks cotton. These insects deposited 80 percent fewer eggs on plants that were both hairless and nectarless than on a strain comparable to commercial varieties.

In addition, bolls of plants having the nectarless trait showed significantly fewer mines (tunnels) caused by larvae of the pink bollworm and a significant reduction in larvae of the cotton leafworm and the cotton-damaging cabbage looper.

ARS entomologists M. J. Lukefahr and D. F. Martin and geneticist J. R. Meyer also report that the absence of epidermal hairs enhances the grade of mechanically harvested cotton by reducing leaf trash.☆

AN ELECTRONIC WATERSHED

ARS engineer designs a simple computer that solves hydrologic problems

■ Computations of surface and underground water movement that require hours of work with a desk calculator are completed in seconds with an inexpensive electronic device designed by ARS hydraulic engineer J. M. Rosa, for solving hydrologic problems.

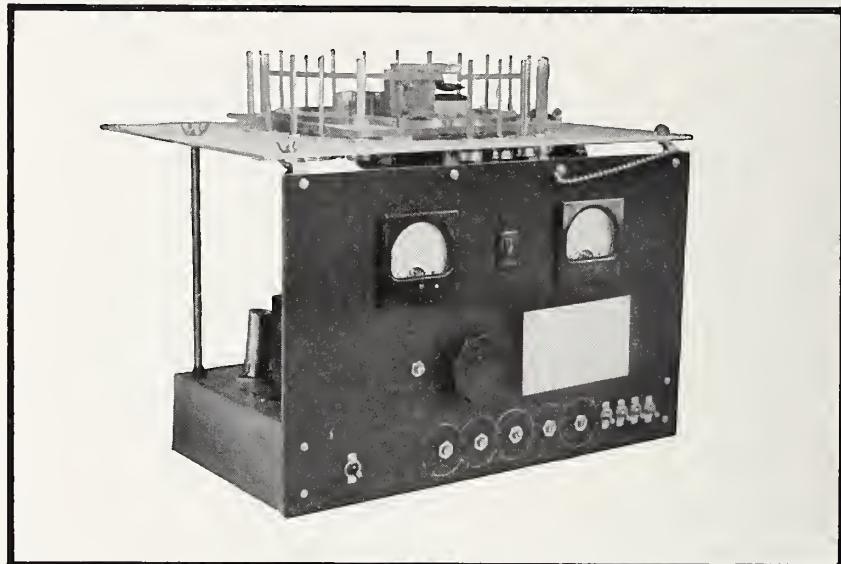
The device, an electronic analog simulator, should save much time for designers of flood-control structures. It can also be used in estimating irrigation water supplies, forecasting floods, and studying other hydrologic problems involving either rain or snow.

University of Idaho physicists and the Idaho Agricultural Experiment Station, Moscow, are cooperating in Rosa's research.

In studying water movement, hydrologists must take into account the complex influences of topography, ground cover, soils, and geology—all of which affect the amount and timing of flow and flood peaks at some downstream point. The scientists customarily divide the watershed into a series of sections or stages and make their computations for each stage in sequence. The downstream discharge is represented on a graph (called a hydrograph) showing the amount of water passing a point during several hours.

The analog simulator is an electrical network of adjustable resistors and capacitors. When calibrated, it becomes a model of the watershed being studied.

Each section of the electrical circuitry represents a stage—a part of the channel for surface flow studies or the available storage for seepage



The analog simulator, a network of adjustable resistors and capacitors, can be calibrated to represent conditions of a given watershed. Flow of electricity serves as flow of water.

water in the soil or rock mantle. A recorder draws a graph of current flow passing from the electrical network—or, in effect, produces a hydrograph.

Water, electricity flows are similar

The operation of analog simulators is based on the analogy between basic physical laws governing the flow of water and electricity. Stated in simple terms, the amount of water discharged at a given point depends on the head or force moving it and the resistance offered by the channel or pipe. Similarly, the amount of electricity discharged (amperage) is a function of the force (voltage) and the resistance of the conductor.

Electronic models are particularly useful in solving hydrologic problems

when data is limited. An engineer designing a dam, for example, may need to know the peak flood to be expected from a storm of a magnitude that occurs once in 100 years. He is unlikely to have data on such a storm, but he may have hydrographs (from water-level recorders) and precipitation records from other storms on the watershed.

He will first calibrate the analog simulator, using this data, which involves determination of three variables—water loss by infiltration and percolation, the number of stages required for the computation, and the time of storage in each stage.

Rosa says only one choice or combination of the three variables will best duplicate the selected hydrographs of the previous storms in gen-

Pure Stands...The First Year

*Agronomist perfects way
to grow weed-free stands of grass for seed*



Rear view of the simulator shows the relative simplicity of the unit.

eral shape and type of occurrence. One of the advantages of the analog simulator is the speed with which it produces the hydrographs as the engineer seeks the best combination. He is also aided by having the modeled watershed before him.

Will calibrate largest storms

Once the analog simulator is calibrated, it will produce the hydrograph of any rainfall pattern for that watershed—including the storm that comes once in 100 years. And the device will also produce hydrographs of storms on any other physically similar drainage area for which runoff data is lacking.

The experimental analog simulator used by Rosa was built from radio parts at a cost of about \$100.☆

■ Producing a pure stand of grass for seed is a difficult job, particularly if the new crop is planted in a field where a different grass variety had been growing.

Volunteer plants sprouting from seeds left in the soil by the previous crop, along with fast-growing weeds, become strong competitors with the new grass. Such contamination usually prevents a harvest free of crop and weed seeds for the first 2 or 3 years.

To give grass-seed producers more flexibility in crop changeovers, ARS research agronomist William O. Lee is experimenting with nonresidual and short-residual herbicides near Corvallis, Oregon. Current tests conducted in cooperation with the Oregon Agricultural Experiment Station are proving so successful that investigators expect modified versions of the same treatment to be workable in other areas of grass-seed production.

Lee's method is designed to control weeds and volunteer crop plants without harming the new crop. To do this, he prepares a seedbed in changeover fields in the fall, thereby bringing undesirable seeds close to the soil surface and producing an "autumn harvest" of weeds and volunteer crop plants. When these plants have emerged, he destroys them by spraying with a nonresidual herbicide.

Grass seeds for the new crop are planted very early in the spring,

just below the surface of the soil, without further seedbed preparation. This avoids disturbing any undesirable seeds still remaining. The new crop is then able to grow rapidly, without competition—and produce a pure stand the first year.

Several different herbicides have been tested. Since all are nonresidual or short-residual, they leave no carryover toxicity in either the seed or the soil. Of those tested—paraquat and a combination of IPC plus 2,4-D have shown most promise.

Lee also found that timing of the herbicide applications has a marked effect on the degree of success. During the first year's testing, he made initial applications on selected plots in December, February, and March. Under western Oregon conditions, the February and March treatments were much less effective than those made in late December. On the basis, subsequent applications were made in December and January.

Investigators feel that this method, if properly refined and modified for use in different geographical areas, could save grass-seed producers both time and money in completing a changeover. They could move quickly to take advantage of favorable prices, keep each field productive every year, and sell crops at least 2 years sooner than is possible under present production methods.☆

Comparing Mulches

Scientists check effects of four mulching materials on 6-percent slope

■ Asphalt emulsion sprayed on sloping soil plots controlled erosion better than prairie hay, wheat straw, or woodchips in recent tests.

ARS agricultural engineers N. P. Swanson and A. R. Dedrick, and soil scientists H. E. Weakly and H. R. Haise tested the mulching materials at various rates per acre, both with and without disk-packing treatments. Their research—financed in part by the U.S. Navy's Bureau of Yards and Docks—was cooperative with the Nebraska Agricultural Experiment Station.

The comparisons were made to find improved ways to establish soil cover in difficult areas, such as military installations, construction sites, and road embankments.

The tests were conducted on silty clay loam on 12- by 35-foot plots that sloped about 6 percent. All plots were plowed 8 inches deep and smoothed with a rotary hoe operated at an angle: both operations were done on the contour. Three unmulched check plots were used—two were disk packed, the third was plowed and smoothed only.

The scientists soaked each plot with three simulated rainstorms. The first was at the rate of $2\frac{1}{2}$ inches per hour and lasted for 1 hour and 24 minutes; the second, 18 to 20 hours later, was $2\frac{1}{2}$ inches per hour for 1 hour; and the third, beginning as soon as runoff from the second storm stopped, was 5 inches per hour for 18 minutes.

The scientists took samples of runoff from each plot at 6-minute intervals throughout the tests. They then totaled the soil losses from the three storms for each plot and found that

losses ranged from nearly zero to $12\frac{1}{2}$ tons.

So that the plots could be compared, the total soil loss for each plot was computed as a percentage of the soil loss from the check plot that was neither mulched nor disk packed.

The researchers also ran tests on the amount of water permitted by each mulch to penetrate into the soil. Asphalt, asphalt and prairie hay, and

woodchip mulches had the highest intake rates during the first rainstorm. Intake rates were the same, however, for all mulched plots during the second and third storms.

The asphalt emulsion, which is available commercially, was applied at the rate recommended by the manufacturer. The scientists now believe the lower rates would probably be as effective—and more economical.★

TYPE OF MULCH	RATE APPLIED PER ACRE	DISK-PACK TREATMENT	RELATIVE * EROSION
Asphalt	1,210 gallons	None	2
Asphalt and prairie hay	1,210 gallons $\frac{1}{2}$ ton	None	3
Woodchips	9 tons	None	6
Woodchips	6 tons	None	6
Woodchips	3 tons	None	70
Woodchips	1 ton	None	194
Prairie hay	1 ton	Cross-slope	17
Prairie hay	$\frac{1}{2}$ ton	None	20
Prairie hay	$\frac{1}{2}$ ton	Cross-slope	30
Prairie hay	$\frac{1}{2}$ ton	Downslope	196
Prairie hay	$\frac{1}{4}$ ton	Cross-slope	66
Wheat straw	1 ton	Cross-slope	15
Wheat straw	$\frac{1}{4}$ ton	Cross-slope	124
None	—	None	100
None	—	Cross-slope	125
None	—	Downslope	545

* PERCENT OF EROSION AS RELATED TO CHECK PLOT.

WURLD wheat has more vitamins

Niacin, choline, and minerals of original wheat are almost completely retained in bulgur made by a new low-cost peeling process developed at the Western utilization research laboratory, Albany, Calif.

Called WURLD wheat, the new product name reflects its *world-wide* usefulness, the *whirling* action that gently removes the bran, and the initials of the laboratory where it was developed.

The new debranning method (AGR. RES., January 1965, p. 15) retains all of the endosperm—including the nutritious aleurone layer. Storage stability of the peeled bulgur is at least equal to that of ordinary bulgur.

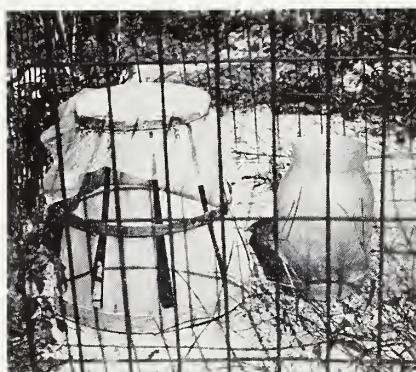
Analysis of WURLD wheat by utilization scientists A. D. Shepherd and J. W. Pence has also shown that more than half of the thiamine, riboflavin, vitamin B-6, pantothenic acid, and folic acid of the original wheat remains in the new product.

This new peeled wheat is comparable to whole wheat products and enriched white flour in its content of major B vitamins.

Tested: New control for vinegar fly

ARS entomologists H. C. Mason and F. F. Smith achieved promising results with chemosterilant baits to control the vinegar fly, *Drosophila melanogaster*, in isolated tomato field plots at Beltsville, Md.

In some of the plots, the entomologists used fermenting bait or hampers of tomatoes to attract the flies to surfaces containing residues of the chemosterilant apholate. Other plots were treated with an insecticide widely used for *Drosophila* control, and still others



Researchers used baited jars, sprayed on the outside with apholate and covered with apholate-sprayed hampers.

were left untreated as checkplots.

Although the insecticide gave the greatest overall control, ranging from 57 to 93 percent, control on some plots containing the apholate bait was as high as 63 percent.

The scientists achieved the best results from the chemosterilant treatments by placing baited jars at a rate of 16 per acre. The jars had been sprayed on the outside with a 2-percent apholate solution and then covered with apholate-sprayed hampers. They had less success when they sprayed hampers of ripe tomatoes with apholate and placed them in the plots. This method averaged only about 28 percent control.

All treatments reduced egg-laying and emergence of flies from eggs. The baited-jar treatment produced best results in sterilizing *Drosophila* flies: More than 60 percent were sterilized in tests over a 2-year period.

The entomologists conducted the experiments to test the concept of using a chemosterilant to prevent increases in the wild *Drosophila* population and thus avoid serious injury to tomatoes.

Fungi scatter parasite larvae

Spores of certain fungi may play an important part in spreading parasites on pastures, thereby increasing the opportunity for contact between the parasites and host animals as they graze.

How this happens is being studied by ARS parasitologists W. E. Bizzell and Honorico Ciordia at Experiment, Ga.

Most fungi of the genus *Pilobolus* discharge their spores explosively, distributing them as far as 8 feet away from the mature fungi. These spores are picked up by grazing animals, pass harmlessly through the digestive tract, and develop into fungi in droppings in another part of the pasture.

Larvae of internal parasites of cattle—such as stomach and intestinal hairworms—follow about the same path as the fungi. They are picked up by cattle with forage, mature and invade some tissue or organ of the animal, and shed eggs into the digestive tract which are eliminated by the animal in manure.

A large number of parasite larvae have been found to migrate to the upper surface of the maturing fungi. Then, when the fungi explode and spread their spores, the parasite larvae are propelled away from the manure pad by the same force that propels the spores.

To give an idea of how important this explosive transportation may be to the dissemination of parasite larvae, the ARS scientists placed plastic film “traps” at varying distances from cattle manure cultures. During one hour, as many as 444 larvae were collected from a 7- by 10-inch piece of film placed 6 inches above a manure pad.

OFFICIAL BUSINESS

AGRISEARCH NOTES

Trichomoniasis spread is surveyed

A cattle disease that causes abortion and infertility in cows is widespread in western beef herds, according to a survey conducted by an ARS scientist.

A potentially serious economic threat to stockmen, trichomoniasis spreads rapidly within a herd or to other herds through the selling, mixing, or trading of breeding stock. It



is transmitted by bulls and is caused by a protozoan parasite, *Trichomonas foetus*.

The survey was conducted seasonally from 1956 through 1963 by ARS parasitologist A. E. Johnson, Logan, Utah, who tested 828 bulls in 34 beef herd associations in Utah, Idaho, Wyoming, Nevada, Colorado, New Mexico, and Arizona. In these associations, several breeding herds are banded together on a common summer range, which increases the chances of widespread *T. foetus* infection.

Twenty-six percent of the herds and 7.5 percent of the bulls in the associations were infected. Most of these were in Utah, but infected animals were found in herds from northern Wyoming to southern Arizona.

Unless treated, bulls usually have

trichomoniasis for life; but cows usually recover if separated from bulls for 3 months. Such a rest period is considered normal good management in most beef herds.

Routine examination and removal of infected bulls coupled with good management practices can lead to eradication of the disease from a herd. Treatments, though expensive, are available for curing bulls of this disease. A simple, but still experimental, treatment was reported last year (Agr. Res., Dec., 1963, p. 15).

In preliminary experiments at Beltsville, Md., dimetridazole (1,2-dimethyl-5-nitroimidazole), administered orally in capsules, effectively eliminated *T. foetus* from the genitalia of infected bulls. The drug will not be recommended for trichomoniasis control until expanded experiments and field trials have been conducted and the drug has proved acceptable for registration.

Drat those MAN-eating mosquitoes

To mosquitoes, men may be significantly more attractive than women, ARS research has shown.

Entomologists I. H. Gilbert, H. K. Gouck, and Nelson Smith compared the extent to which 50 women and 50 men attracted the yellow fever mosquito (*Aedes aegypti*) in tests at Gainesville, Fla. The influence of skin temperature and moisture was considered in determining the attrac-

tiveness of the 100 individuals.

The scientists also recorded the length of time each person was protected by the chemical repellent deet, developed in ARS research. Deet is the main ingredient in many commercial insect repellents.

Women treated with the repellent were protected longer from mosquito attack, on the average, than were men who had been treated.



Persons in the test with the highest skin temperature were more attractive to mosquitoes than those with the lowest skin temperature.

The repellent gave longer protection to women with low skin temperatures than to women with high skin temperatures. Skin temperature made little or no difference in the length of time deet protected men.

Women who perspired heavily were more attractive to mosquitoes than women who perspired lightly. Men who perspired heavily, however, were less attractive than those who perspired lightly.

Women who perspired lightly were protected from mosquitoes longer by the repellent. The amount of perspiration made little or no difference in length of time that the insect repellent protected men.